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Chapter 6

Operating Data and Performance Measures

In today's competitive environment for scarce public resources, transit agencies must continually strive for excellence in management and operations, and use objective benchmarks and standards by which to hold themselves accountable as stewards of the taxpayer's investment in local public transit. As William Thomson, the distinguished Scottish Physicist is so frequently quoted as saying, "When you can measure what you are speaking about and express it in numbers you know something about it," and, "If you cannot measure it, you cannot improve it."

A positive reputation and a high level of public trust directly impact the transit industry's ability to operate effectively. In fact, the very survival of most urban transit systems depends on building, sustaining, stabilizing, and protecting local support. It is important to understand, then, that building public trust is not the responsibility of one department or function. It is an organizational responsibility based on developing and implementing credible policies and practices, and setting standards for measurement and continual improvement.

In addition to measuring one's performance for self-improvement, performance measures can be used to effectively communicate results to our governing bodies and the general public. In addition, this manual addresses a number of performance statistics that must be measured because of the dictates of certain regulatory and reporting requirements (e.g., NTD reports, ODOT Certification of Data, etc...)

Performance Measurement Categories

Ordinarily for a business, "performance" is measured simply by profits and loss analysis, which tells us about the efficient use of resources. An important question for transit, however, is how to measure performance in a business that is not concerned with profit in the traditional sense. Beyond performance measures required by regulatory and reporting requirements, how a transit agency categorizes and measures performance really depends on that agency's vision and the clarity of its focus on desired outcomes. If an agency measures everything, its focus tends to become fragmented and scattered. If the agency measures what is most important to its mission, the agency provides an opportunity to assess where it is currently and the effectiveness of various strategies to get the agency closer to where it wants to be in the future.

Therefore, an important first step in developing an agency's performance measure categories (beyond regulatory reporting requirements) is to work with

our governing bodies to agree on a vision for the future and on supporting strategies and goals. What is most important? Is it meeting or exceeding customer expectations? Internally? Externally? Is it running an efficient operation? Is it meeting specific community goals? Is it to assure that our services remain relevant as the world around us continues to change?

The Transit Cooperative Research Program (TCRP) Report 88, "A Guidebook for Developing a Transit Performance-Measure System," is an excellent resource for transit systems in choosing and understanding various performance measures. Among other things, that report offers an extensive collection of performance measures (130 families of measures and over 400 individual measures) as a reference for agencies developing or updating a performance measurement program. While not necessarily exhaustive, they do represent a reasonably comprehensive cross-section of measures that are currently used in the transit industry. In addition, the report provides guidance to transit agencies on how to consider various performance measures depending on the agency's goals and objectives, and/or system size.

TCRP Report 88 contains detailed information and menus from which to select performance measures in the following categories.

Categories of Primary Measures:

- Availability (includes measures of spatial, temporal, paratransit and capacity availability)
- Service Delivery (includes measures of reliability, customer service, passenger load measures, and goal accomplishment)
- Community (includes measures of mobility, outcomes, and the environment)
- Travel Time (includes measures dealing with time and speed)
- Safety and Security (includes measures related to passenger safety and security)
- Maintenance and Construction (includes measures related to maintenance and construction)
- Economic (includes measures addressing utilization, efficiency, effectiveness, and administration)
- Capacity (includes measures related to person and vehicle capacity)

Categories of Secondary Measures:

- Paratransit
- ADA Accessibility
- Service Contracting
- Comfort

Types of Measures

When deciding upon the types of measures to use, an agency needs to consider the number of measures to be reported, the amount of detail to be provided, the kinds of comparisons that are desired to be made, and the intended audience. There are certainly tradeoffs relative to each of these considerations, and there are several different types of measures that agencies use to help address these tradeoffs.

Individual Measures

Individual measures refer to something that can be measured directly, such as ridership, frequency, or number of employee work days lost to injury. While these measures are usually easy to calculate and explain, they often require a large number of measures to present a complete enough picture. In addition, some kinds of comparisons require a combination of individual measures and ratios to make fair comparisons.

Ratios

Ratios are developed by dividing one individual measure by another, such as cost per revenue mile, vehicle miles per square mile, or passengers per seat. Ratios facilitate comparisons between routes, areas, or agencies and are not much more difficult to calculate or explain than an individual measure.

Indices

Index measures help to simplify the reporting of potentially complex measures, such as service availability. Index measures result from the combination of several other performance measures in an equation to produce a single output measure. Often, the output measure is normalized to fit a 0-10, 1-5, etc. scale for ease of presentation. Indices can be produced by means of an equation that weights different factors based on their importance, or from a regression model that relates an output measure to several input measures. Using indices offer the advantage of minimizing the number of measures reported. Alternatively, indices cannot be directly measured in the field, are not particularly intuitive, and may mask significant changes in their component measures. One index factor could greatly improve while another index factor greatly declines, resulting in a minimal change in the overall index.

Levels of Service (LOS)

The LOS concept was originally developed by the 1965 “Highway Capacity Manual” as a means of simplifying the presentation of potentially complex highway measures and, particularly, to help interpret how travelers perceive conditions represented by a particular performance measure value. The basic LOS concept is to assign “A” to “F” letter scores (highest to lowest) to specified

ranges of values of a particular measure, based on user perceptions of the service quality associated with that measure. LOS measures represent the user (i.e., passenger) point of view, rather than the agency point of view. In addition, LOS scores cannot be interpreted as are school grades. An agency should not necessarily be aiming for “A’s” or “B’s” but rather an appropriate LOS that balances passenger service quality with agency resources. However, the grades are similar in that LOS “F” should be considered a condition that most passengers would find unacceptable.

Data Sources, Data Collection Techniques, and Applications

The most common sources for data collection include:

In-House

In-house data sources rely on records that an agency typically collects or has on hand, and only requires good record-keeping. Examples include schedule data, system maps, service design standards, demand responsive service dispatch logs, maintenance records, operations logs, accident and incident records, financial data, fleet data, employee records, and complaint records.

National Transit Database (NTD)

As detailed in Chapter 4, FTA requires all urbanized area program grant recipients to annually report certain statistical information. Over 600 organizations supply information to the NTD, mainly urban transit systems and private carriers who supply purchased (contracted) service. This information is compiled into the National Transit Database, which is readily available to the general public via the NTD website: **www.ntd.program.com**. The data is usually several years in the arrears.

Examples of available NTD data include: service area characteristics (e.g., area and population); agency type; number of vehicles operated in annual maximum service; sources of, and uses for, capital funds; sources of, and uses for, operating funds; labor hours and cost data; overall agency income and expenses; fleet information; rail and maintenance infrastructure data; directional route miles by bus facility types; safety and security incidents; amount of service provides (e.g., vehicle miles, vehicle hours, and days of service); amount of service consumed (e.g., unlinked trips and passenger miles); and energy consumption.

NTD data is frequently used to compare transit agencies, primarily in terms of safety or economic performance. Such comparisons can be misleading, however, because agencies have not always consistently reported data and different agency objectives can lead to different performance measure results.

As a result, drawing conclusions about service quality, etc. should not be made without considering the context in which an agency operates.

Other Agencies

Other local, state, and federal agencies often can supply data on external factors that can influence how well a transit system can provide service. The local MPO is often an excellent source of local data such as demographic, traffic, GIS, and transportation planning models.

Automatic Vehicle Location (AVL), Automatic Passenger Counters (APC), and Electronic Farebox Data

To more accurately collect and produce timely reports, some transit agencies are using automated or semi-automated data collection. It is important to seriously consider how the data will be stored and managed when considering an investment in automated technologies. Often, the data collected can be overwhelming.

AVL Can be used to track the real-time location of AVL-equipped buses for use in dispatching, real-time bus arrival information, responding to emergencies, etc. Can also be used to collect and store data about bus arrival and departure times at specified locations.

APC Potential data that can be output or derived from APC systems include: stop, route, and system-level ridership; maximum passenger loads and their locations; passenger miles; how long standing loads occur during a trip; and how often loads exceed a pre-determined level.

Electronic Farebox Are often used to obtain route- and system-level ridership. In addition, the farebox may be able to determine and automatically record what kind of fare was paid (particularly if magnetic fare cards are used). Buttons can be used to indicate other kinds of events, such as a wheelchair boarding. Newer electronic fareboxes can also record information such as the time the fare was paid and the unique identification number associated with each magnetic farecard.

There does exist the potential for data errors when relying on data from electronic fareboxes. For example, there can be hardware and software problems; errors resulting from operators failing to follow the proper procedures; errors from maintenance staff failing to properly download data, or ambiguous assigning of buttons to various fare categories.

A number of agencies are implementing smart cards (i.e., plastic cards with embedded computer chips). While offering agencies and passengers a number of benefits, those benefits can best be experienced through regional consortiums or by larger sized transit agencies.

Manual Data Collection

Ridership and schedule reliability information are frequently collected manually by bus operators, traffic checkers, and/or field supervisors. Manually data collection can have minimal measurement error but can be unreliable for drawing system-wide conclusions because of the typically small sample size.

Customer Satisfaction Surveys

Satisfaction surveys are valuable tools to understand what is most important to customers and to develop benchmarks and measures on how well an agency is meeting or exceeding customer needs and expectations. While many smaller transit agencies do not have the research budget necessary to regularly survey its customers, customer satisfaction surveys can be conducted when an agency is developing its performance measures to assure the agency is measuring what matters most to its customers.

Safety Reviews

Safety reviews or audits should be used on a regular basis to catch potential safety problems before they result in an incident. The FTA Office of Safety and Security and state agencies regulating the safety of passenger transportation can provide information on conducting safety reviews.

Passenger Environment Surveys

Environmental surveys are used to track transit cleanliness and ride comfort and can involve a review of buses, bus stops and transit stations. These are usually conducted by a dedicated team of surveyors and may not be feasible for smaller systems with limited resources. Areas reviewed might include cleanliness and appearance, customer information, functioning equipment, and operator appearance.

Setting Performance Standards

If performance measures are linked to agency goals, performance standards should be established for each measure. These standards are used to determine whether or not each goal is being accomplished. TCRP Report 88 identifies six (6) main methods that agencies use to develop standards for measures tracked regularly (e.g., weekly to annually). The report recommends that agencies use a combination of the methods described below since each has its advantages and shortcomings:

Comparison to Annual Average: The average value for each measure is determined annually, and the routes that fall into the lowest percentile are identified for further action. This allows systems with limited resources to focus their actions toward the poorest-performing routes.

Comparison to a Baseline: In this case, the value for each measure is compared to the average value for the measure in the first year that the performance-measurement system was implemented. Measures that fall below a certain percentage of the baseline value are targeted for further action. This method requires that the baseline be adequate; otherwise, the performance standard could be met but not the goal that the standard relates to.

Trend Analysis: In this case, the standard is expressed as “improvement from the previous year,” or “x% improvement over the previous year.” Measures that show worsening performance, compared to the previous year, would be targeted for further action.

Self-Identified Standards: Under this method, transit management (often with consultation by its governing board) sets targets based on a combination of current agency performance, professional judgment, and agency goals. This method allows customer and community issues to be considered and, if the standards are updated on a regular basis, allows for continual performance improvement.

Comparison to Typical Industry Standards: This method surveys other representative transit agencies or finds examples of standards in the transit literature and applies an average or typical standard to its own operations. While this method is defensible, it fails to consider either other agencies’ special circumstances or the agency’s own special circumstances.

Comparison to Peer Systems: Under this method, an agency identifies other agencies with similar conditions (e.g., city size, level of government support, fare levels, goals and objectives, cost of living indices, etc.), and determines how well those agencies are performing in the measurement categories. Standards are based on the average values of the peer agencies for given measures, or alternatively, some percentile value. If using this method, it is important to follow up with potential peers to identify areas of differences that could influence comparisons between agencies.